

CLAIMS:

1. An anode monitoring system for monitoring the integrity of anodes provided on a metallic structure
5 for cathodic protection purposes, the system comprising a signal circuit having at least one signal path comprising the metallic structure and a selected anode whereby the characteristics of the signal circuit depend on the effectiveness of the selected
10 anode, a signal generator for generating and applying a signal to the signal circuit, and a central station for monitoring signals on the signal circuit to thereby determine whether the selected anode is effective.
- 15 2. An anode monitoring system according to Claim 1 in which the signal generator is arranged, when the selective anode is effective, to apply a signal to the signal circuit which is indicative of the
20 effectiveness of the selected anode.
3. An anode monitoring system according to Claim 1 in which the signal generator is disposed at the selected anode.

4. An anode monitoring system according to claim 1, the arrangement being such that at least one of absence and defectiveness of the selected anode is detectable due to the absence of an expected signal.

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5. An anode monitoring system according claim 1 which the signal circuit comprises a return path via earth and the selected anode, when effective, provides a conduction path from the metallic structure to earth.

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6. An anode monitoring system according to claim 1 in which the signal circuit comprises an impedance element provided in series between the selected anode and the metallic structure.

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7. An anode monitoring system according to Claim 6 in which the impedance element is arranged to give a high impedance to time varying signals within at least one selected range of frequencies and a low impedance to signals outside the selected range.

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8. An anode monitoring system according to Claim 7 in which the impedance element is arranged so that the real part of the impedance is substantially zero.

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9. An anode monitoring system according to claim 6 further comprising at least one of a transmitter and a receiver connected across the impedance means and arranged to respectively transmit and receive signals
5 across the impedance means.

10. An anode monitoring system according to Claim 1 in which the signal generator comprises a reference signal generator arranged to apply a reference signal
10 to the signal circuit and an effective impedance varier for varying the effective impedance of the signal circuit in accordance with data to be transmitted wherein the reference signal generator is located at a position which is remote from the
15 selected anode and the impedance varier is located adjacent the selected anode.

11. An anode monitoring system according to claim 1 which comprises a plurality of signal paths each
20 comprising the metallic structure and a respective anode which is arranged so that signals associated with each anode are generated at different, randomly determined, times.

25 12. An anode monitoring method for monitoring the

integrity of anodes provided on a metallic structure for cathodic protection purposes comprising the steps of:

generating a signal and applying said signal to a
5 signal circuit, the signal circuit comprising at least one signal path comprising the metallic structure and a selected anode whereby the characteristics of the signal circuit depend on the effectiveness of the selected anode; and

10 monitoring signals on the signal circuit at a central station to thereby determine whether the selected anode is effective.

13. A data transmission system comprising a
15 transmitter, a receiver and a metallic structure which in use acts as a signal channel between the transmitter and the receiver, wherein the metallic structure includes at least one anode provided for cathodic protection purposes, an impedance element is
20 disposed in series between the metallic structure and the anode, and at least one of the transmitter and the receiver is connected across the impedance element.

14. A data transmission system according to Claim 13
25 in which the impedance element is arranged to have a

high impedance to time varying signals within at least one selected range of frequencies and a low impedance to signals outside the selected range.

- 5 15. An anode arrangement for use in an anode monitoring system, the arrangement comprising a ~~sacrificial~~ anode arranged for mounting on a metallic structure, an impedance element having one terminal connected to the anode and another terminal arranged
10 for connection to said metallic structure, and an electronics module connected across the impedance means for at least one of transmitting and receiving signals.
- 15 16. A subsea pipeline power transmission system comprising a pipeline, an electrical power supply connected to the pipeline at a first location, and at least one connector provided on the pipeline at a second location for connection of a load to the
20 pipeline to allow the load to receive electrical power from the power supply via the pipeline wherein the pipeline has a plurality of cathodic protection anodes, each of which is electrically connected via a respective impedance element to the pipeline.

17. A power transmission system according to claim 16
in which each impedance element is arranged to give a
high impedance to time varying signals within at least
one selected range of frequencies and a low impedance
5 to signals outside the selected range.

18. A power transmission system according to claim 17
in which each impedance element is arranged so that
the real part of the impedance is substantially zero,
10 such that there is no significant attenuation of dc
components of signals passing through the impedance
means.

19. A power transmission system according to claim 17
15 in which the impedance element comprises an inductance
element.

20. A power transmission system according to claim 17
in which the impedance element comprises a filter.

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21. A method of subsea pipeline power transmission
along a pipeline having a plurality of cathodic
protection anodes comprising the steps of:

applying electrical power to the pipeline at a
25 first location; and

electrically connecting a load to be supplied to the pipeline at a second location;

wherein each anode is electrically connected via a respective impedance element to the pipeline.

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22. Apparatus for use in a subsea pipeline power transmission system comprising:

an anode arrangement comprising, a cathode protection anode arranged for mounting on a pipeline
10 and an impedance element having one terminal connected to the anode and another terminal arranged for connection to said pipeline; and

an electrical power supply arranged for electrical connection to a pipeline.

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23. An anode arrangement for use in a subsea pipeline power transmission system, the arrangement comprising, a cathode protection anode arranged for mounting on a pipeline and an impedance element having one terminal
20 connected to the anode and another terminal arranged for connection to said pipeline.

24. An anode arrangement according to claim 23 including terminals allowing the connection of a load
25 across the impedance element.

25. An anode monitoring system for monitoring the integrity of anodes provided on a metallic structure for cathodic protection purposes, the system comprising a signal circuit having at least one signal
5 path comprising the metallic structure and a selected anode whereby the characteristics of the signal circuit depend on the effectiveness of the selected anode, signal generation means for generating and applying a signal to the signal circuit, and a central
10 station for monitoring signals on the signal circuit to thereby determine whether the selected anode is effective.